Testimony of Roger Hagengruber

before the
Energy Subcommittee of the
House Science Committee

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Thank you Congresswoman Biggert and members of the Subcommittee for the opportunity to testify.

I'm Roger Hagengruber. I am a physicist by training and currently Director of the Office for Policy, Security and Technology (OPS&T) at the University of New Mexico. From 1991 to 1999, I was Senior Vice President of Sandia National Laboratory directing their nuclear weapons programs. I spent much of my more than 30-years at Sandia in arms control and non-proliferation activities including several tours in Geneva as a negotiator.

I am also chair of the Nuclear Energy Study Group (NESG), convened by the Panel on Public Affairs of the American Physical Society. We examined technical options for raising the barrier between nuclear power and nuclear weapons proliferation. With your permission, I would like to include a copy of the report in the hearing record.

We reached conclusions in three general areas: technical safeguards, proliferation resistance evaluation & design, and reprocessing.

Let me first say that I am presenting the consensus view of a diverse group of scientists who are experts on nuclear power and proliferation issues. Over the course of their careers, members of the NESG held positions as DOE Undersecretary of Energy, Chair of the DOE Nuclear Energy Research Advisory Committee, director of research for the Nuclear Regulatory Commission, and acting Assistant Secretary of Defense.

Over the course of several months of discussion, we developed a consensus position on reprocessing. Here are our three main points:

- *There is no urgent need to reprocess.*
- *Take the time to get the science right.*
- *Do no harm.*

Let me say a few words about each point.

No Urgency

No foreseeable expansion of nuclear power in the US will make a qualitative change to the need for spent fuel storage over the next few decades. Even though Yucca Mountain may be delayed considerably, interim storage of spent fuel in dry casks, either at current reactor sites, or at a few regional facilities, or at a single national facility, is safe and affordable for a period of at least 50 years.

The US can take some of the next ten years to evaluate technologies and make a more enduring and prudent decision on reprocessing.

Get the Science Right

A decision on reprocessing shouldn't outpace the science. DOE should take the necessary time to carry out more thorough reprocessing research to identify the most proliferation resistant and cost effective technology. Examples of areas of research that could be most useful are:

- Detailed evaluations by nuclear weapons experts regarding the implications of the reprocessed material on a reliable yet concealable weapons program by a proliferating country.
- Concepts for the integration of advanced safeguards (e.g. use control) into reprocessing systems.
- Additional approaches to increasing the inherent protection of the reprocessed material by additional adulteration or other means.

And let me be clear, *it is in the best interests of the US to maintain a reprocessing research program and seek a proliferation resistant and cost-effective reprocessing technology. We do not oppose eventual reprocessing, but believe an early decision, given the current status, could threaten future growth in the use of nuclear energy.*

We believe that by pursuing appropriate reprocessing technology that gives the highest priority to proliferation resistance, the U.S. retains the ability to influence future directions, both technical and institutional, of the international community.

Do No Harm

We should not force a decision that might diminish the growing momentum for nuclear power.

We should take a lesson from the past. More than forty years ago, the Atomic Energy Commission, in an effort to establish a self-sufficient, domestic commercial nuclear power industry, set in motion the transfer of nuclear fuel reprocessing from the federal government to private industry. In response to this call, Nuclear Fuel Services, a private company, built the West Valley plutonium reprocessing plant in upstate New York but without addressing economic and safety issues adequately. The plant began operating in 1966 and closed six years later to address safety, environmental and efficiency problems. It never reopened. The costs for retrofitting were too high, and public concern about the plant had grown too large.

I think the lesson is clear: *we must be cautious and not rush into reprocessing again until the safety, proliferation and cost issues are well understood and have been addressed properly.*

The goal of our recommendations is straightforward: If a reprocessing technology is determined to be adequately proliferation resistant and cost-effective, reprocessing can emerge as a consensus decision with industrial, scientific, political, and public support.

That said, I have to make a confession. As a former VP of Sandia, I recognize the value of timetables. I understand the importance of Congressman Hobson requiring action by 2007.
Timetables keep programs from becoming endless academic exercises.

And while the science may not be able to deliver a proliferation resistant and cost-effective technology by 2007, that doesn't mean you don't try.

So, I applaud Congressman Hobson for challenging the scientists to deliver. That is an effective way to motivate programs.

Nevertheless, I think we should be cautious about our expectations. The lesson from the nation's West Valley foray is that we must proceed carefully.

So, I would make a modest suggestion.

Yes, as Congressman Hobson requires, have the DOE report on the state of reprocessing science in 2007. But, instead of having DOE recommend a particular technology that "should" be implemented in 2007 – I suggest that DOE identify the most promising technology at that juncture were a decision to be made to begin development and that its report include a detailed discussion of the relationship of the technology to the prospect of proliferation. And we must be realistic in our expectations. It may be that despite the best efforts of all involved, the most promising technology in 2007 may still not be satisfactory to all the necessary stakeholders.

I'm recommending a modest change of tone. The change keeps a reprocessing decision as a goal but maintains an open view on the ability to deliver a cost-effective and truly **proliferation resistant** technology by 2007.

The DOE is currently researching reprocessing technologies including pyroprocessing and UREX+. An aspect of assessing proliferation resistance is determining whether the intensity of radioactive "self-protection" of the resulting waste is sufficient to prevent or deter its clandestine development into a nuclear weapon.

Our study group considered the proliferation resistance of UREX+. Some members believed that the current version of UREX+ would create a plutonium byproduct so hot that it was incapable of being used to make a weapon. Others thought that UREX+ "self-protection" is lower than the "self-protection" of current US fuel cycle waste.

Research is on going at DOE to settle this question. We'll see what the research bears out. But, based on my nearly 20 years of involvement in nuclear weapons design I'll make one observation. The ultimate assessment should not be based on whether it is *theoretically possible* to make a weapon

from the waste. A meaningful assessment must evaluate practical factors associated with making a weapon: the level of technical sophistication, the willingness to assume risk, the financial resources available, and the likelihood of success. These are difficult factors to evaluate – some of them will require extensive classified treatment - but I urge DOE to approach the assessment in this manner.

If no cost-effective and proliferation resistant reprocessing technology emerges in 2007, then the US will continue to promote its current path of open-cycle & enrichment. A number of experts are concerned that this path presents significant proliferation risks, as evidenced by Iran. I concur; the spread of centrifuge technology is a significant national security risk.

There are numerous proposals for new international agreements to limit the spread of enrichment technologies. In our report we examined technical steps to limit proliferation. These steps will be most effective when coupled with changes in institutional arrangements.

The first technological step is to improve the primary line of defense against proliferation – international technical safeguards.

Technical safeguards used by the International Atomic Energy Agency sound alarms as soon as nuclear systems stray from peaceful use. They have proven value. In North Korea, environmental sampling helped show that North Korea was making false claims about its reprocessing activities. In Iran, disclosures by opposition groups plus surveillance technologies and environmental sampling are revealing the status of Iran's nuclear program.

Most of the implemented safeguards technologies are the result of scientific work done decades ago. Proliferators are adaptive and motivated adversaries; yet, we are currently relying on technology that is almost as dated as a rotary phone. We must re-invigorate our safeguards R&D program. I'll mention two of the ten R&D focus areas identified in our report.

More inspectors carrying out more inspections is not a sustainable path – instead, next generation safeguards must spur a transition from the current system of periodic manual inspections to a reliable and cost-effective system of continuous remote monitoring. Also, more aggressive safeguards should be explored that would shut down a facility found to be violating

international operating agreements. There are numerous other examples that represent “fruit ripe for the picking” as opposed to research that may never become practical. Additional progress in safeguards should involve collaborative research with international partners. In this regard, the large programs to improve the security of nuclear material in Russia and to assist in conversion offer major opportunities to advance joint safeguards concept to the IAEA.

Unfortunately, as we understand it, the current fiscal year 2005 international safeguards-related technology budget in NNSA (which we believe is already several times too small) was just reduced. At the very time when some would seek more rapid progress on the future of nuclear energy, modern safeguards and a deeper analysis regarding proliferation may be left in the dust. As a nation, we may live to regret our inadequate resources and emphasis in this area because for the future of nuclear energy, “ignorance is not bliss”.

Another technical step to manage global proliferation risks is designing proliferation resistance technology directly into the new nuclear power plants and enrichment facilities. Making proliferation resistance a design criterion would re-shuffle the priority of future reactors. Some fuel-cycles would be deferred, while smaller, modular, reactor designs might receive more emphasis. By carrying out this step with commercial participation, proliferation resistance can emerge as a strength of our nuclear industry. We think that Congress should be very demanding regarding measures of proliferation resistance in any proposed further technical initiatives.

In conclusion, the extent to which nuclear power will be an enduring option to meeting future energy requirements in many regions of the world depends upon the steps Congress takes now to manage the associated proliferation risks. Prudent management requires exclusively pursuing proliferation resistant technologies, developing international agreements that limit the spread of enrichment facilities and investing in a strong safeguards program.

I’m happy to answer any questions.